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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,487	08/30/2001	Yakov Epshteyn	SFI 718D1	9680

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SPEEDFAM-IPEC CORPORATION
305 NORTH 54TH STREET
CHANDLER, AZ 85226

EXAMINER	
TRAN, BINH X	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 04/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/943,487	EPSHTEYN ET AL.	
	Examiner	Art Unit	
	Binh X Tran	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 February 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *8-21 and 23-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8-21 and 23-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 8-17, 23-25, 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (US 6,436,302) in view of Swedek et al. (US 6,190,234).

removing a material (13) overlying a barrier layer (12) from the surface of the semiconductor wafer at a chemical mechanical polishing (CMP) station with a chemical mechanical polishing pad (Fig 1-2);

removing the barrier layer (12) from the semiconductor surface of the semiconductor wafer at a buff station using a buff pad and first barrier slurry (col. 7 lines

31-35, Fig 3; Note: the examiner interprets that barrier layer material (12) removed during the buffing step is mixed with the input slurry to provide a "barrier layer slurry").

Li does not explicitly disclose using abrasive slurry during the chemical mechanical polishing process to remove the material (13). However, Li clearly discloses the step of performing a CMP process to remove material (13). In a CMP process, Swedek discloses using abrasive slurry particles (col. 5 lines 5-12). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Li in view of Swedek by using abrasive slurry because it will enhance the polishing process. Further the use of abrasive slurry is well known in the CMP process.

Respect to claim 9, Li discloses the step of buffing the wafer surface after barrier layer removal (col. 7 lines 36-45). Respect to claim 10, Li discloses a set of buff station parameters are different for the barrier layer removal step than for the buffing step. Respect to claim 11, Li discloses a different slurry composition is used for the barrier layer removal process (i.e. first buffering) than for the wafer buffing step (i.e. second and/or third buffing step) (See col. 6-8).

Respect to claims 12-13, Li fails to disclose the step of detecting material layer and/or barrier layer is substantially removed from the wafer. Swedek discloses the endpoint detecting step to determine whether any material is substantially removed from the wafer. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Li in view of Swedek by detecting when the material or the barrier layer is substantially removed from the wafer because it help us to determine when to stop the removal step.

Respect to claims 14-17, Swedek discloses the endpoint detection system using optical detection system includes infrared or laser detection system (col. 6 lines 1-10 and col.14 lines 60-67). Respect to claims 23-24, Li discloses the layer (13) comprises copper and the barrier layer (12) comprises TaN (col. 6 lines 42-4 7). Respect to claim 25, the cited prior arts teaches supplying the first polishing slurry to the primary or first polishing station and supply a different slurry to the buff station. Respect to claims 27-28, Li discloses removing the barrier layer (12) using slurry comprises abrasive suspension or using slurry comprises acidic or basic solution (col. 5 lines 35-47). Respect to claim 29, Li discloses the second buffing step comprises abrasive slurry and a solution that includes deionized water (col. 7, read on "diluted first barrier slurry").

4. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li and Swedek as applied to claim 8 above, and further in view of Easter (US 6,254,454).

Swedek fails to disclose the endpoint detection system is comprises of motor current detection system. However, Swedek clearly discloses the use of the endpoint detection system. In a semiconductor method, Easter discloses the use of the motor current detection system. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Li and Swedek in view of Easter by using the motor current detection system because equivalent and substitution of one for the other would produce an expected result.

5. Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li and Swedek as applied to claim 8 above, and further in view of Mok (US 6,343,975).

Respect to claim 19, Li and Swedek fail to disclose the step of conditioning the buff station pads. Mok discloses the step of conditioning the buffing station pad (col. 3 lines 58-67). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Li and Swedek in view of Mok by conditioning the buffing station pad because it will maintain the pad so that it will effectively remove material from the substrate.

Respect to claim 20, Mok discloses the conditioning step is accomplished by pressing the lower pad against the upper pad and rotating each pat at different velocity (col. 3). Respect to claim 21, Mok discloses the conditioning is performed between each wafer being process.

6. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li and Swedek as applied to claim 8 above, and further in view of Wang et al. (US 6,395,635).

Li and Swedek fail to disclose using a buff pad having a volume compressibility of about 20-40% to remove the barrier layer. However, Li clearly disclose using a buff pad to remove barrier layer. Wang discloses using a Politex Supreme™ pad to buff the layer (col. 4 lines 50-65). Wang does not explicitly disclose the specific value of volume compressibility. However, in the specification filed on 2-03-2004, the applicants disclose the properties of Politex Supreme™, for example it have volume compressibility of 20-40%. According to MPEP 2112.01, "Products of identical chemical composition can not have mutually exclusive properties. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present".

Therefore, examiner will interpret that Wang teaches to use a buff pad having a volume compressibility of about 20-40%. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Li and Swedek by using Politex Supreme™ because this pad material capable of remove micro-scratch.

Response to Arguments

7. Applicant's arguments filed 02-03-2004 have been fully considered but they are not persuasive.

The applicants argue, "Li does not disclose or suggest removing the Cu layer ("a material layer") on a first CMP station, but instead discloses removing that layer partially on the first platen and completing the removal on the second platen. Even the passage specifically recited by the examiner... specifically points out the Cu layer is not completely removed at the first CMP station". This argument is not commensurate with the scope of the claim. The examiner recognizes that Cu layer is not completely removed at the first CMP station in Li's reference. However, Li clearly teaches that a portion of the Cu layer is removed at the first station. There is no limitation in the claim indicating that the Cu layer must be completely removed at the first station.

The applicants further argue that Li and Swedek should not be combined in the manner suggested by the examiner. According to applicants, Li discloses a process for removal metal, whether Swedek discloses a process for removing a dielectric layer. The examiner disagrees. Swedek describes an advantage in endpoint detection method for the CMP process on the substrate having the abrasive slurry. The removal

layer does not have to be dielectric material. In col. 1-2, Swedek discloses the substrate comprises a conductive layer.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (571) 272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Binh X. Tran

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER